

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Please cancel claims 1-37 and add the following new claims:

- 1-37. (Cancelled)
38. (New) Apparatus for determining a measure of image quality of an image, comprising:
- means for determining a blockiness invisibility measure of the image;
 - means for determining a colour richness measure of the image;
 - means for determining a sharpness measure of the image; and
 - means for providing the measure of image quality of the image based on respective products of the blockiness invisibility measure, the colour richness measure and the sharpness measure of the image with respective attenuation factors.
39. (New) Apparatus according to claim 38, wherein the means for determining the colour richness measure of the image is operable to provide the colour richness based on the sum of respective products of the probabilities of colour values and the logarithms, using e as a base, of those probabilities.
40. (New) Apparatus according to claim 38, wherein the means for determining the sharpness measure of the image is operable to provide the sharpness based on the sum of respective products of the probabilities of differences in a plurality of colour channel values between neighbouring portions of the image and the logarithms of those probabilities.
41. (New) Apparatus according to claim 40, wherein the differences between neighbouring portions of the image are differences in image data between neighbouring pixels.
42. (New) Apparatus for determining a blockiness invisibility measure of an image, comprising:
- means for averaging differences in colour values at block boundaries within the image;
 - means for averaging differences in colour values between adjacent pixels; and

means for providing the blockiness invisibility measure based on a relative strength of the averaged differences in colour values at block boundaries within the image with respect to the averaged differences in colour values between adjacent pixels.

43. (New) Apparatus for determining a colour richness measure of an image, comprising:

means for determining the probabilities of individual colour values within the image;

means for determining respective products of the probabilities of individual colour values and the logarithms, using e as a base, of the probabilities of individual colour values; and

means for providing the colour richness measure based on the sum of the respective products of the probabilities of individual colour values and the logarithms, using e as the base, of the probabilities of individual colour values.

44. (New) Apparatus for determining a sharpness measure of an image, comprising:

means for determining differences in a plurality of colour values between adjacent pixels within the image;

means for determining respective probabilities of individual colour channel value differences within the image;

means for determining respective products of the probabilities of individual colour value differences and the logarithms of the probabilities of individual colour value differences; and

means for providing the sharpness measure based on the sum of the respective products of the probabilities of individual colour value differences and the logarithms of the probabilities of individual colour value differences.

45. (New) Apparatus according to claim 38, wherein the means for determining a blockiness invisibility measure of the image comprises an apparatus for determining a colour richness measure of an image, comprising:

means for determining the probabilities of individual colour values within the image;

means for determining respective products of the probabilities of individual colour values and the logarithms, using e as a base, of the probabilities of individual colour values; and

means for providing the colour richness measure based on the sum of the respective products of the probabilities of individual colour values and the logarithms, using e as the base, of the probabilities of individual colour values.

46. (New) Apparatus according to claim 38, wherein the means for determining a colour richness measure of the image comprises an apparatus for determining a colour richness measure of an image, comprising:

means for determining the probabilities of individual colour values within the image;

means for determining respective products of the probabilities of individual colour values and the logarithms, using e as a base, of the probabilities of individual colour values; and

means for providing the colour richness measure based on the sum of the respective products of the probabilities of individual colour values and the logarithms, using e as the base, of the probabilities of individual colour values.

47. (New) Apparatus according to claim 38, wherein the means for determining a sharpness measure of the image comprises an apparatus for determining a sharpness measure of an image, comprising:

means for determining differences in a plurality of colour values between adjacent pixels within the image;

means for determining respective probabilities of individual colour channel value differences within the image;

means for determining respective products of the probabilities of individual colour value differences and the logarithms of the probabilities of individual colour value differences; and

means for providing the sharpness measure based on the sum of the respective products of the probabilities of individual colour value differences and the logarithms of the probabilities of individual colour value differences .

48. (New) Apparatus for determining a measure of image quality of an image within a sequence of two or more images, comprising:

apparatus according to claim 38; and

means for determining a motion activity measure of the image within the sequence of images.

49. (New) Apparatus for determining a motion activity measure of an image within a sequence of two or more images, comprising:

means for determining differences in a plurality of colour values between pixels within the image and corresponding pixels in a preceding image within the sequence of images;

means for determining respective probabilities of individual colour value differences between the image and the preceding image;

means for determining respective products of the probabilities of individual colour value differences and the logarithms of the probabilities of individual colour value differences; and

means for providing the motion activity measure based on the sum of the respective products of the probabilities of individual colour value differences and the logarithms of the probabilities of individual colour value differences.

50. (New) Apparatus according to claim 48, wherein the means for determining a motion activity measure of the image within the sequence of images comprises an apparatus for determining a motion activity measure of an image within a sequence of two or more images, comprising:

means for determining differences in a plurality of colour values between pixels within the image and corresponding pixels in a preceding image within the sequence of images;

means for determining respective probabilities of individual colour value differences between the image and the preceding image;

means for determining respective products of the probabilities of individual colour value differences and the logarithms of the probabilities of individual colour value differences; and

means for providing the motion activity measure based on the sum of the respective products of the probabilities of individual colour value differences and the logarithms of the probabilities of individual colour value differences

51. (New) Apparatus according to claim 48, wherein the means for providing the measure of image quality of the image is operable to provide the image quality measure further based on the motion activity measure of the image.

52. (New) Apparatus for determining a measure of video quality of a sequence of two or more images, comprising:

apparatus according to claim 38; and

means for providing the measure of video quality based on an average of the image quality for a plurality of images within the sequence of two or more images.

53. (New) Apparatus according to claim 38, operable to make the determination without reference to a reference image.

54. (New) A method of determining a measure of image quality of an image, comprising:

determining a blockiness invisibility measure of the image;

determining a colour richness measure of the image;

determining a sharpness measure of the image; and

providing the measure of image quality of the image based on respective products of the blockiness invisibility measure, the colour richness measure and the sharpness measure of the image with respective attenuation.

55. (New) A method according to claim 54, wherein determining the colour richness measure of the image comprises providing respective colour richness based on the sum of the products of the probabilities of colour values and the logarithms using e as a base, of those probabilities.

56. (New) A method according to claim 55, wherein determining the sharpness measure of the image comprises providing the sharpness based on the sum of respective products of the probabilities of differences in a plurality between neighbouring portions of the image and the logarithms of those probabilities.

57. (New) A method according to claim 56, wherein the differences between neighbouring portions of the image are differences in image data between neighbouring pixels.

58. (New) A method for determining a blockiness invisibility measure of an image, comprising:

averaging differences in colour values at block boundaries within the image;

averaging differences in colour values between adjacent pixels; and

providing the blockiness invisibility measure based on a relative strength of the averaged differences in colour values at block boundaries within the image with respect to the averaged differences in colour values between adjacent pixels.

59. (New) A method for determining a colour richness measure of an image, comprising:

determining the probabilities of individual colour values within the image;

determining the respective products of the probabilities of individual colour values and the logarithms using e as a base, of the probabilities of individual colour values; and

providing the colour richness measure based on the sum of the respective products of the probabilities of individual colour values and the logarithms using e as a base, of the probabilities of individual colour values.

60. (New) A method for determining a sharpness measure of an image, comprising:

determining differences in a plurality of colour channel values between adjacent pixels within the image;

determining respective probabilities of individual colour value differences within the image;

determining respective products of the probabilities of individual colour value differences and the logarithms of the probabilities of individual colour value differences; and

providing the sharpness measure based on the sum of the respective products of the probabilities of individual colour value differences and the logarithms of the probabilities of individual colour value differences.

61. (New) A method according to claim 17, wherein determining a blockiness invisibility measure of the image comprises a method for determining a blockiness invisibility measure of an image, comprising:

averaging differences in colour values at block boundaries within the image;

averaging differences in colour values between adjacent pixels; and

providing the blockiness invisibility measure based on a relative strength of the averaged differences in colour values at block boundaries within the image with respect to the averaged differences in colour values between adjacent pixels.

62. (New) A method according to claim 54, wherein determining a colour richness measure of the image comprises a method determining a blockiness invisibility measure of an image, comprising:

averaging differences in colour values at block boundaries within the image;

averaging differences in colour values between adjacent pixels; and

providing the blockiness invisibility measure based on a relative strength of the averaged differences in colour values at block boundaries within the image with respect to the averaged differences in colour values between adjacent pixels.

63. (New) A method according to claim 54, wherein determining a sharpness measure of the image comprises a method for determining a sharpness measure of an image, comprising:

determining differences in a plurality of colour channel values between adjacent pixels within the image;

determining respective probabilities of individual colour value differences within the image;

determining respective products of the probabilities of individual colour value differences and the logarithms of the probabilities of individual colour value differences; and

providing the sharpness measure based on the sum of the respective products of the probabilities of individual colour value differences and the logarithms of the probabilities of individual colour value differences.

64. (New) A method for determining a measure of image quality of an image within a sequence of two or more images, comprising:

a method according to claim 54; and

determining a motion activity measure of the image within the sequence of images.

65. (New) A method for determining a motion activity measure of an image within a sequence of two or more images, comprising:

determining differences in a plurality of colour channel values between pixels within the image and corresponding pixels in a preceding image within the sequence of images;

determining respective probabilities of individual colour value differences between the image and the preceding image;

determining respective products of the probabilities of individual colour value differences and the logarithms of the probabilities of individual colour value differences; and

providing the motion activity measure based on the sum of the respective products of the probabilities of individual colour value differences and the logarithms of the probabilities of individual colour value differences.

66. (New) A method according to claim 64, wherein determining a motion activity measure of the image within the sequence of images comprises a method for determining a motion activity measure of an image within a sequence of two or more images, comprising:

determining differences in a plurality of colour channel values between pixels within the image and corresponding pixels in a preceding image within the sequence of images;

determining respective probabilities of individual colour value differences between the image and the preceding image;

determining respective products of the probabilities of individual colour value differences and the logarithms of the probabilities of individual colour value differences; and

providing the motion activity measure based on the sum of the respective products of the probabilities of individual colour value differences and the logarithms of the probabilities of individual colour value differences.

~~67. (New) A method according to claim 64, wherein providing the measure of image quality of the image comprises providing the image quality measure further based on the motion activity measure of the image.~~

68. (New) A method for determining a measure of video quality of a sequence of two or more images, comprising:

a method according to claim 54; and

providing the measure of video quality based on an average of the image quality for a plurality of images within the sequence of two or more images.

69. (New) A method according to claim 54, wherein the determination is made without reference to a reference image.

70. (New) A method of determining a measure of video or image quality substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

71. (New) Apparatus according to any claim 38, operable in accordance with the method of determining a measure of image quality of an image, comprising:

determining a blockiness invisibility measure of the image;

determining a colour richness measure of the image;

determining a sharpness measure of the image; and

providing the measure of image quality of the image based on respective products of the blockiness invisibility measure, the colour richness measure and the sharpness measure of the image with respective attenuation.

72. (New) Apparatus for determining a measure of video or image quality constructed and arranged substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

73. (New) A computer program product having a computer usable medium having a computer readable program code means embodied therein for determining a measure of video or image quality, the computer program product comprising:

computer readable program code means for operating according to the method of claim 54.

~~74. (New) A computer program product having a computer usable medium having a computer readable program code means embodied therein for determining a measure of video or image quality, the computer program product comprising:~~

~~computer readable program code means which, when downloaded onto a computer renders the computer into apparatus according to claim 38.~~